# NVA Mapping Distribution Mechanism

draft-dunbar-nvo3-nva-mapping-distribution-00

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Various ways of NVAs connected to NVEs

Core

Directory

Directory

DIR
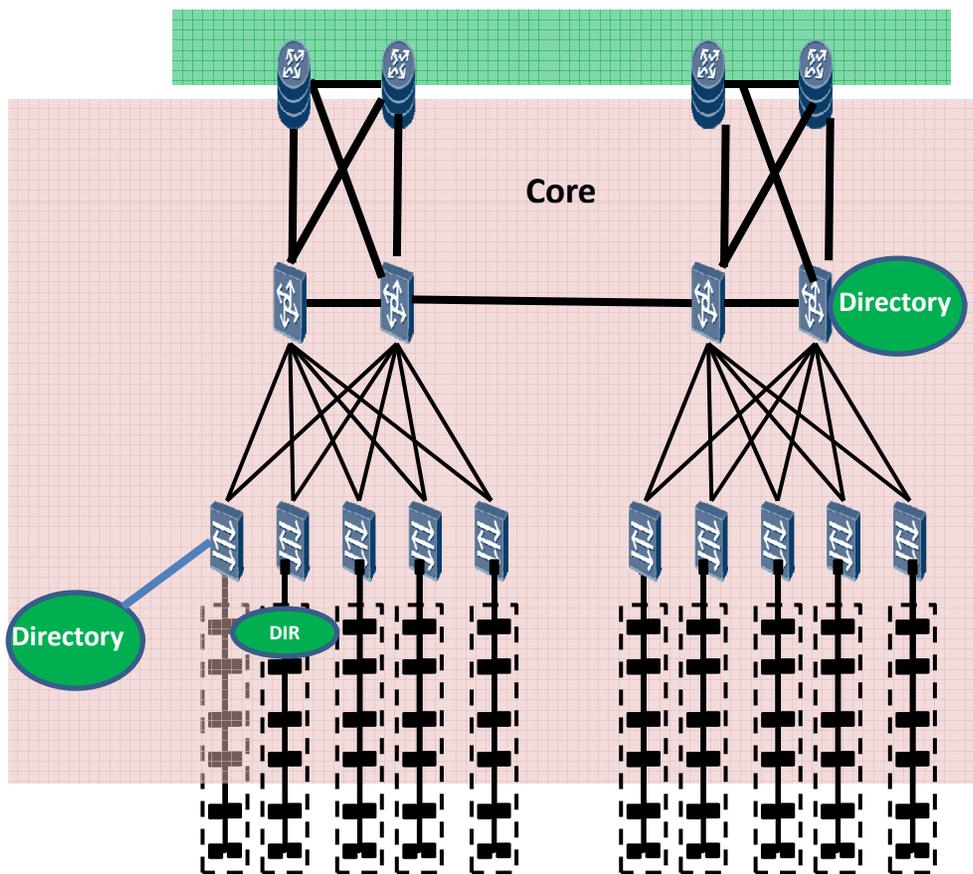
Locations:

- Embedded in routers/switches in the core, or as standalone servers attached to them.

- Standalone servers or VMs connected to Edges via the client side port

Contents:

- Centralized NVA

- Distributed NVA:

  - Each NVA has mapping for a subset of VNs

  - multiple NVAs have mapping entries for a VN

Push Model

- **Incremental Push Service Update**
  - Achieved by Link State Update to distribute the incremental updates.
- **Requesting Push Service:**
  - Push NVAs use VN scoped reliable Link State flooding to announce their availability to push mapping information.
  - NVEs use VN scoped reliable Link State flooding to announce all the Virtual Networks in which they are participating
  - Whenever, there are changes in the mapping entries, NVA uses CSNP messages to only send the changed portion of the entries.
- **Policies:** When ingress edge can't find entries for the incoming data frame:
  - simply drop the data frame,
  - flood it to all other edges that are in the same VN, or
  - start the "pull" process to get information from Pull NVA

Reachable Interface Addresses (IA) TLV

- To advertise a set of addresses within a VN being attached to (or reachable by) a specific NVE
- These addresses can be in different address families. For example, it can be used to declare that a particular interface with specified IPv4, IPv6, and 48-bit MAC addresses in some particular VN is reachable from a particular NVE.

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Type = TBD                    |      (2 bytes)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Length                        |      (2 bytes)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Addr Sets End                 |      (2 bytes)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| NVE Address subTLV   ...             (variable)
+-+-+-+-+-+-+-+-+-+-+-+-
| Flags          |                     (1 byte)
+-+-+-+-+-+-+-+-+-+
| Confidence     |                     (1 byte)
+-+-+-+-+-+-+-+-+-+-
| Template ...                         (variable)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...-+
| Address Set 1    (size determined by Template)     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...-+
| Address Set 2    (size determined by Template)     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...-+
|   ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...-+
| Address Set N    (size determined by Template)     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...-+
| optional sub-sub-TLVs ...
+-+-+-+-+-+-+-+-+-+-+-+-...
```

Requesting Push Service

- When a NVE is initialized or re-started, it uses Virtual Network scoped instances of the IS-IS to announce all the Virtual Networks in which it is participating
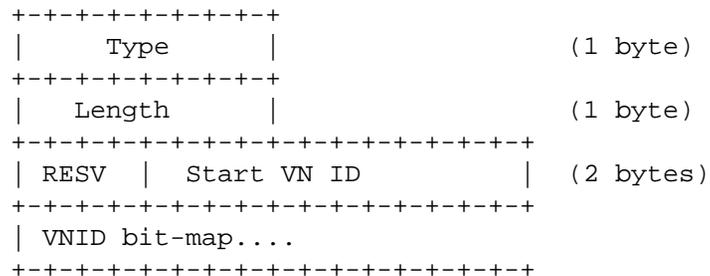
```
+-+-+-+-+-+-+-+-+
|     Type      |                (1 byte)
+-+-+-+-+-+-+-+-+
|    Length     |                (1 byte)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| RESV |   Start VN ID      |    (2 bytes)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| VNID bit-map....
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
Figure 2. Enabled-VN TLV
```

Incremental Push service

- A new TLV is needed for to carry CSNP timeout value and a flag for NVA to indicate it has completed all updates.

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Type                          |     (2 bytes)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Length                        |     (2 bytes)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|R|  Priority    |                    (1 byte)
+-+-+-+-+-+-+-+-+
| CSNP Timeout  |                     (1 byte)
+-+-+-+-+-+-+-+-+
| Flags         |                     (1 byte)
+---------------+
| Reserved for expansion              (variable)
+-+-+-+-...
```
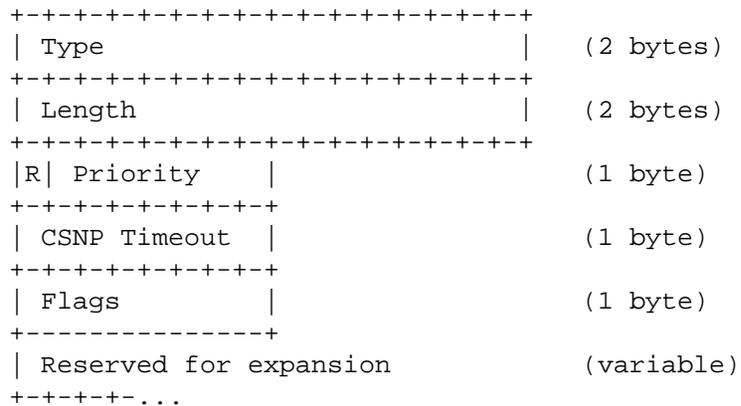
    Figure 3. CSNP Complete TLV
Flags: A byte of flags defined as follows:

```
          0   1   2   3   4   5   6   7
        +---+---+---+---+---+---+---+---+
        | UN|CP |        RESV           |
        +---+---+---+---+---+---+---+---+
```
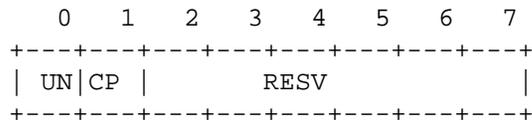
Pull Query Format

- **Pull Request** Triggered by:
  - An NVE receives an ingress data frame with a destination whose egress NVE is unknown, or
  - An NVE receives an ingress ARP/ND request for a target whose link address (MAC) or egress edge NVE is unknown.
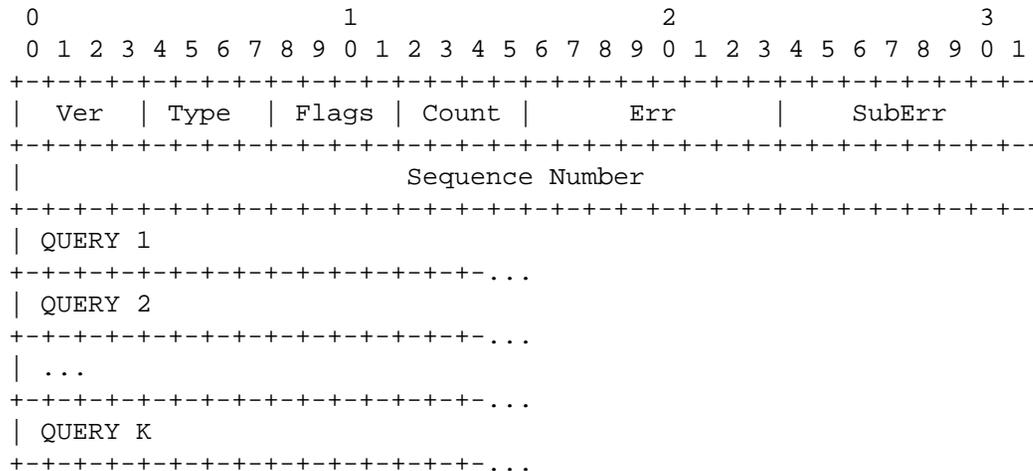
```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Ver  | Type  | Flags | Count |       Err       |    SubErr     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Sequence Number                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| QUERY 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
| QUERY 2
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
| ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
| QUERY K
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
Figure 4. Pull Query TLV
```

Query Record

QUERY: Each QUERY Record within a Pull Directory Query message is formatted as follows:

```
              0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
             +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
             |         SIZE          |  RESV  |    QTYPE     |
             +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
               If QTYPE = 1
             +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
             |                      AFN                      |
             +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
             |  Query address ...
             +--+--+--+--+--+--+--+--+--+--+--...
               If QTYPE = 2, 3, 4, or 5
             +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
             |  Query frame ...
             +--+--+--+--+--+--+--+--+--+--+--...
```

```
           QTYPE    Description
           -----    -----------
              0     reserved
              1     address query
              2     ARP query frame
              3     ND query frame
              4     RARP query frame
              5     Unknown unicast MAC query frame
           6-14     assignable by IETF Review
             15     reserved
```
AFN: Address Family Number of the query address.

PULL Responses

- **When the mapping entry is available in the NVA**
  - **Valid Response** (TRILL/LISP)
- **When the mapping is not available:**
  - "drop" or "native-forward" (i.e. flooding)
- **cache timer**

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Ver  | Type | Flags | Count |      Err       |    SubErr     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     Sequence Number                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| RESPONSE 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
| RESPONSE 2
+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
| ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
| RESPONSE K
+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
```

Pull Response

RESPONSE: Each RESPONSE record within a Pull NVA Response message is formatted as follows:

```
    0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
   +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
   |         SIZE         |OV|  RESV  |   Index    |
   +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
   |                    Lifetime                   |
   +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
   |                Response Data ...
   +--+--+--+--+--+--+--+--+--+--+--...
```

Push-Pull Hybrid Model

- Push model are used for some VNs, and pull model are used for other VNs.
  - It can be operator's decision (i.e. by configuration) on which VNs' mapping entries are pushed down from NVA (e.g. frequently used) and which VNs' mapping entries are pulled (e.g. rarely used).
  - Useful for Gateway nodes where great number of VNs are enabled.
- Or, a portion of hosts in a VN is pushed, other portion has to be pulled.